

**CAPA / NCDOT Asphalt Training Workshop**  
**February 21-22, 2012**  
**Raleigh, NC**

NCDOT – “Final Surface Testing”

IRI Standard Specification

Article 610-13  
2012 Standard Specifications



# NCDOT - Ride Quality Background

In Standard Specifications forever!

Standard 10 Ft. Non-Mobile Straightedge  
Article 610-12 of 2012 Standard Specs.



# NCDOT - Ride Quality Background

- 1996 - Smoothness Committee was appointed by the Secretary of Transportation.
  - Charged with researching other methods in addition to the Non-Mobile Straightedge for checking Pavement Smoothness
  - Develop a Project Special Provision for the new method which became the Hearne Straightedge (10' Rolling Straightedge).



# NCDOT - Ride Quality Background

- National Highway User's survey in 1996 indicated that nationwide pavement conditions were the No. 1 concern of traveling public
- Rideability Specification developed for 5 projects let in Nov. 1996



# NCDOT - Ride Quality Background

- Full implementation considered for 1997
- Pavement Smoothness Task force was established
- June 2005 – Memo on Rideability (still an issue)
- Rideability Group was established with Industry Reps.



# NCDOT - Ride Quality Background

- Final Surface Testing SP (2 or more lifts of asphalt, 45 mph, 1000')
- Hearne Straightedge – Asphalt Pavement
- Rainhart Profilograph – Concrete Pavement



Hearne Straightedge –  
Developed in NC by Tom Hearne



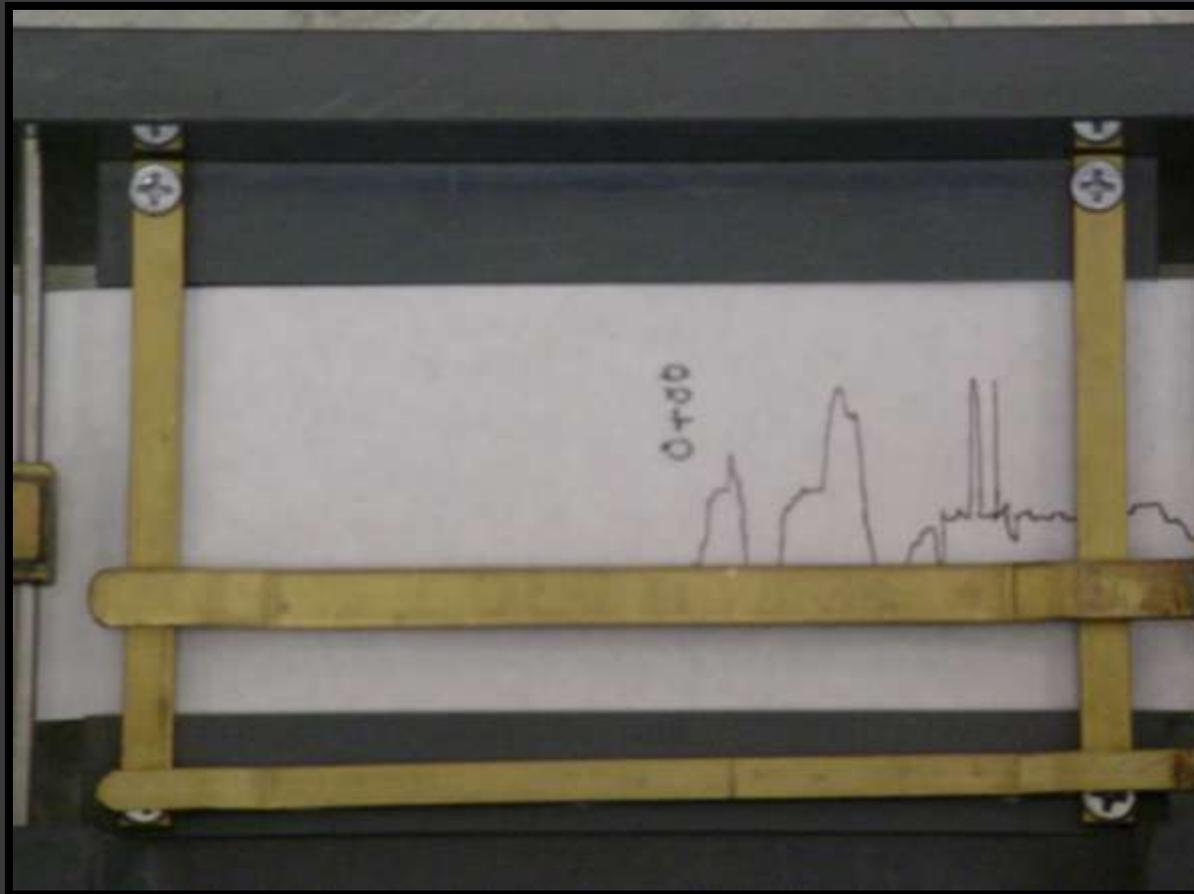
Hearne is a 10-ft Rolling Straightedge pushed at 2 mph



# Graph produced by Hearne Straightedge



# Graph produced by Hearne Straightedge



# Hearne Straightedge

## Index Numbers

- ◉ Straightedge Index  
**(SEI)**
- ◉ Indicates deviations that exceed 0.2 & 0.3” blanking band within a 100 ft. test section
- ◉ Cumulative Straightedge Index  
**(CSI)**
- ◉ Represents total SEIs for one lot, which consists of not more than 25 consecutive test sections



# Hearne Straightedge

12/17/2002 QA/QC-7

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**N.C. Hearne Straightedge Summary**

Project No.: \_\_\_\_\_ Route: \_\_\_\_\_ Division: \_\_\_\_\_  
 Type Mix: \_\_\_\_\_ Lane: \_\_\_\_\_ Profile Location: \_\_\_\_\_  
 Paving Contractor: \_\_\_\_\_ S.E. Operator: \_\_\_\_\_

Date	T.S. #	Beg. Station No.	End. Station No.	S.E.I.	D.4" Dev.	Retest SEI	Comments
9/21/2002	1	1+12	2+00	3-2	1	2-0	
9/21/2002	2	2+00	3+00	1-0		0-0	
9/21/2002	3	3+00	4+00	0-0		0-0	
9/21/2002	4	4+00	5+00	0-0		0-0	
9/21/2002	5	5+00	6+00	0-0		0-0	
9/21/2002	6	6+00	7+00	0-0		0-0	
9/27/2002	7	7+00	8+00	1-0		0-0	
9/27/2002	8	8+00	9+00	0-0		0-0	
9/27/2002	9	9+00	10+00	0-0		0-0	
9/27/2002	10	10+00	11+00	0-0		0-0	
9/27/2002	11	11+00	12+00	0-0		0-0	
9/27/2002	12	12+00	13+00	1-0		0-0	
9/27/2002	13	13+00	14+00	0-0		0-0	
9/27/2002	14	14+00	15+00	0-0		0-0	
9/28/2002	15	15+00	16+00	0-0		0-0	
9/29/2002	16	16+00	17+00	1-0		1-0	
9/29/2002	17	17+00	18+00	0-0		0-0	
9/29/2002	18	18+00	19+00	0-0		0-0	
9/29/2002	19	19+00	20+00	1-0		0-0	
9/29/2002	20	20+00	21+00	2-1	1	1-0	
9/29/2002	21	21+00	22+00	0-0		0-0	
9/30/2002	22	22+00	23+00	0-0		0-0	
10/1/2002	23	23+00	24+00	0-0		0-0	
10/2/2002	24	24+00	25+00	0-0		0-0	
10/3/2002	25	25+00	26+00	0-0		0-0	
				C.S.I.	10-3	C.S.I.	4-0

**Note 1:**  
Resident Engineer to furnish gold copy to MST Unit upon completion of Federal Aid Projects only.

**\*Note 2:**  
Contractor Must be notified by letter of any Pay Adjustments or Corrective Actions.

CC:  
 White: Resident Engineer  
 Yellow: Pavement Construction Engineer  
 Pink: Division Engineer  
 Gold: Resident Engineer(See Note 1)

**\*Print Name Legibly:** \_\_\_\_\_

**\*Evaluators Signature:** \_\_\_\_\_

**\*BY PROVIDING THIS DATA UNDER MY SIGNATURE AND/OR HICAMS NUMBER, I ATTEST TO THE ACCURACY AND VALIDITY OF OF THE DATA CONTAINED ON THIS FORM AND CERTIFY THAT NO DELIBERATE MISREPRESENTATION OF TEST RESULTS, IN ANY MANNER, HAS OCCURRED.**

Resident/District Engineers Certification

Check One

Block

\$300 Incentive

\$100 Incentive

Acceptable

\*\$300 Disincentive

\*\$500 Disincentive

Resident/District Engineer: \_\_\_\_\_

Remarks: \_\_\_\_\_



# Rainhart profilograph for concrete pavements and bridges



This is an Asphalt Workshop...moving on!



# Issues with Profilographs

- These “contraptions” are slow (2 mph)
- Can take multiple runs to complete
- Traffic control issues (lane closures)
- Results are subjective (graphs on paper)
- Not a true profile of roadway



Fast forward to 2011...

IRI!

International Roughness Index

Pavement smoothness measured with Laser Profiler mounted on a vehicle  
(Deviations Measured in Units = in/mile)



# The Benefits?

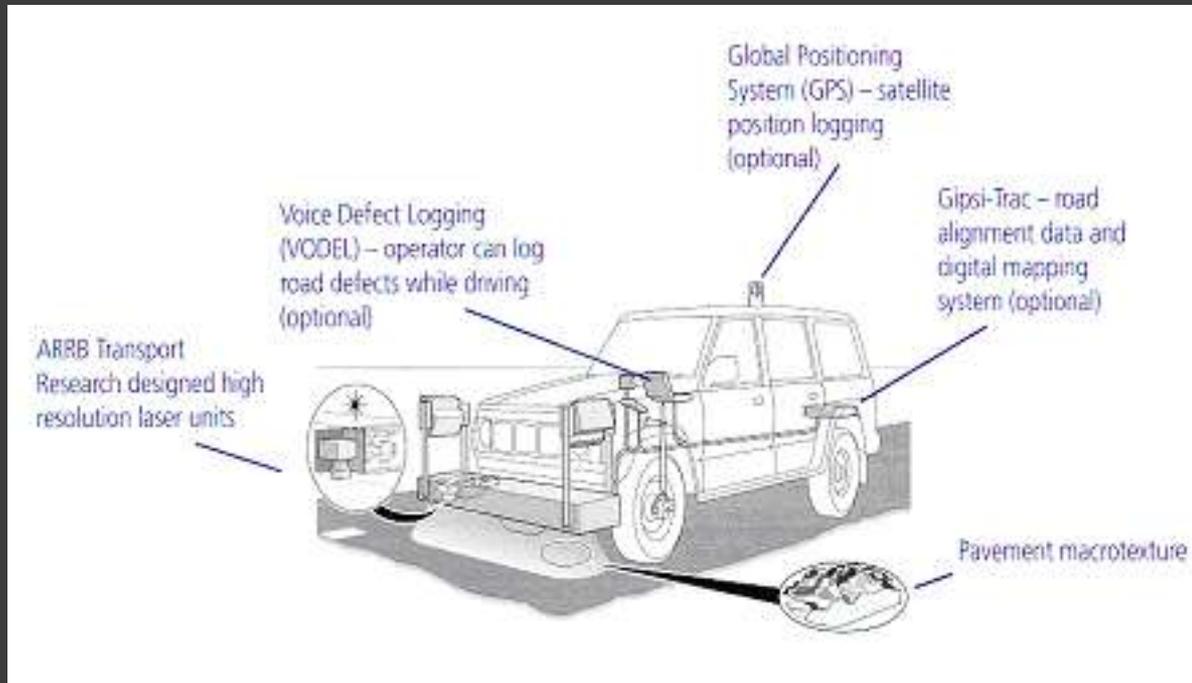
Mounted on Golf carts...  
Vehicles < 30 mph



SUVs, Vans, Pickups...  
Vehicles up to 70 mph



# Laser Profiler Setup



- NCDOT – Pavement Management Unit has profiler equipment and has been measuring IRI for years on our Interstates
- PMU has 4 profilers (Single 5-Pt lasers – can go to 7)
- 2 DynaTest and 2 ICC

# Line Laser Technology



RoLine and TriODS sensors mounted on lightweight profiler.



# NC Turnpike Authority - IRI Special Provision

- NCTA had an IRI spec on WWF and Monroe projects
- NCTA used 65 in/mile on asphalt and 75 in/mile on concrete



NCTA hired Consultant to perform IRI testing



# NCDOT - IRI Development

- 2008 – NCDOT had pilot project w/ Percent Improvement SP
- 2011 - NCDOT developed draft IRI Spec
- Received Industry input on draft IRI spec
- Reconvened Rideability group for asphalt
- 2012 – NCDOT implemented Standard Specification for IRI
- Intent - Use IRI spec for new location construction (Bypass are ideal)



# NCDOT – IRI Specification Details

- For asphalt, still include Hearne as an option (**Option #2 - 2012 Standard Specifications**)
- Contractor performs smoothness testing or hires a firm
- In 2010, AASHTO documents on Inertial profilers and systems were updated and finalized

**Article 610-13 ... 2012 Specifications**



# NCDOT – IRI Specification Details

In August 2003, the American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Materials (SOM) adopted Provisional Standards to address these needs, which were further revised between 2007 and 2010 as the following full standards:

**M 328-10** Standard Specification for Inertial Profiler

**R 54-10** Standard Practice for Accepting Pavement Ride Quality when Measured Using Inertial Profiling Systems

**R 56-10** Standard Practice for Certification of Inertial Profiling Systems

**R 57-10** Standard Practice for Operating Inertial Profiling System



# NCDOT – IRI Specification Details

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**Article 610-13 ... 2012 Specifications**



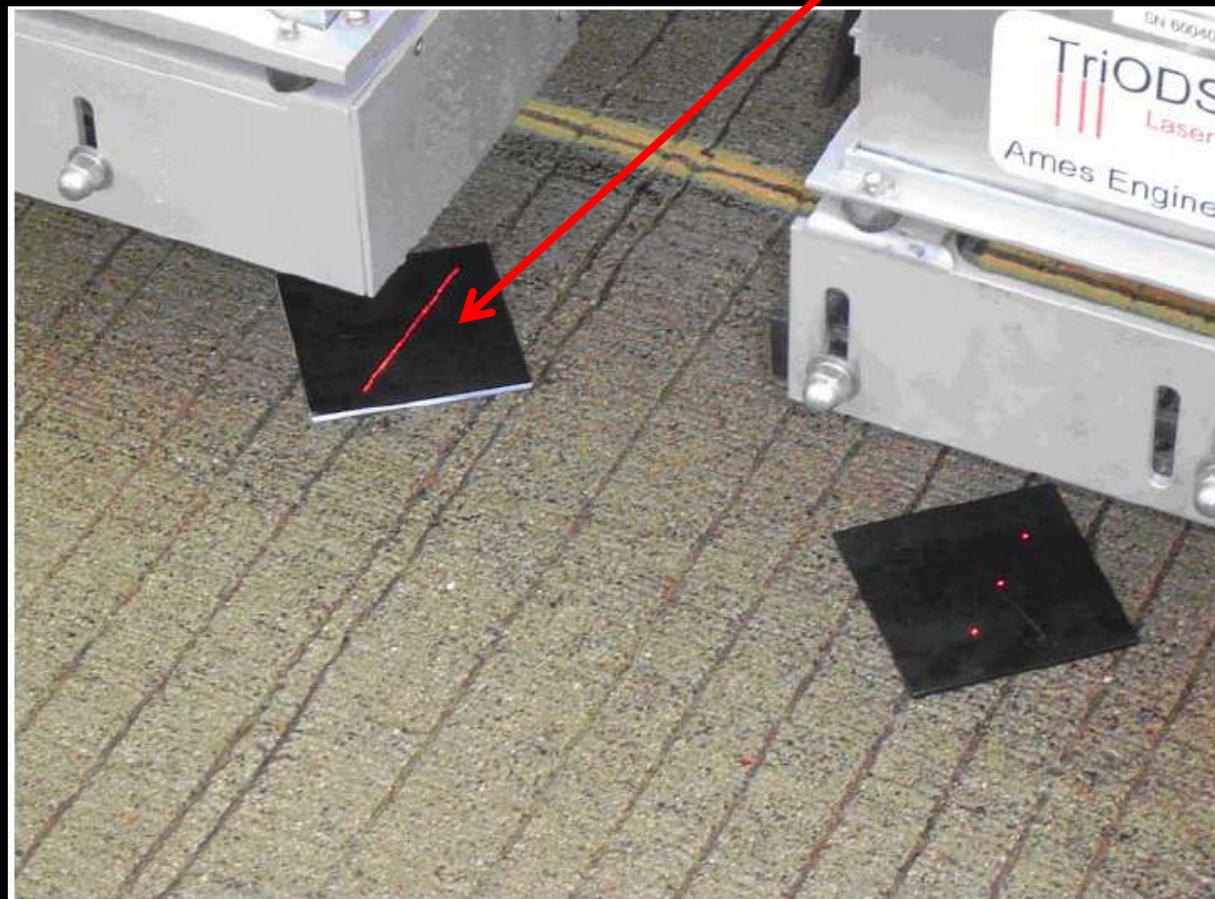
# NCDOT – IRI Specification Details

- Need calibrated profiler and trained, competent personnel using the system
- Use low-speed or high-speed profiler
- Run profiler on both wheel paths at same time
- Will allow separate runs...one per each wheel path

Article 610-13 ... 2012 Specifications



# NCDOT Specifications require use of Line Laser technology



Sensor footprint of the RoLine and TriOD sensors.

# Line Laser Technology



**Pavemetrics LCMS with  
Accelerometer to collect  
IRI values**



# NCDOT – More details on IRI Specification

- Data provided to RE after each run on approved media (CD, DVD, flash drive)
- DOT will analyze raw data on FHWA ProVAL software
- DOT can do QA to verify data with PMU profilers



# NCDOT – More details on IRI Specification

- Contractor provides results report - 10 days after completion of smoothness testing
- IRI numbers for 0.10-mile sections (MRI is average of IRI numbers from both wheel paths)
- NCDOT – Same numbers for both pavement types w/ acceptance range from 55-70
- Pay Incentives / Adjustment “continuous” formulas



# NCDOT – Pay Adjustment Chart

- Price adjusted based on MRI numbers per lane
  - 45.0 or under PA = \$200 per 0.10 mile
  - 45.1 to 55.0 PA = 600 – (10\*MRI)
  - 55.1 to 70.0 Acceptable (No PA)
  - 70.1 to 90.0 PA = 650 – (10\*MRI)
  - Over 90.1 Corrective Action Required
- Corrective action must be approved by RE
- Areas of Localized roughness (>125.0 in 25')



# Project Criteria

- Implementation on projects in 2012
- Criteria when Final Surface Testing applies:
  - 1) Facility is 45 mph or greater
  - 2) Length is 1 mile or greater
  - 3) Must have 2 lifts of asphalt pavement



# 2012 "Final Surface Testing" Standard Specification Review



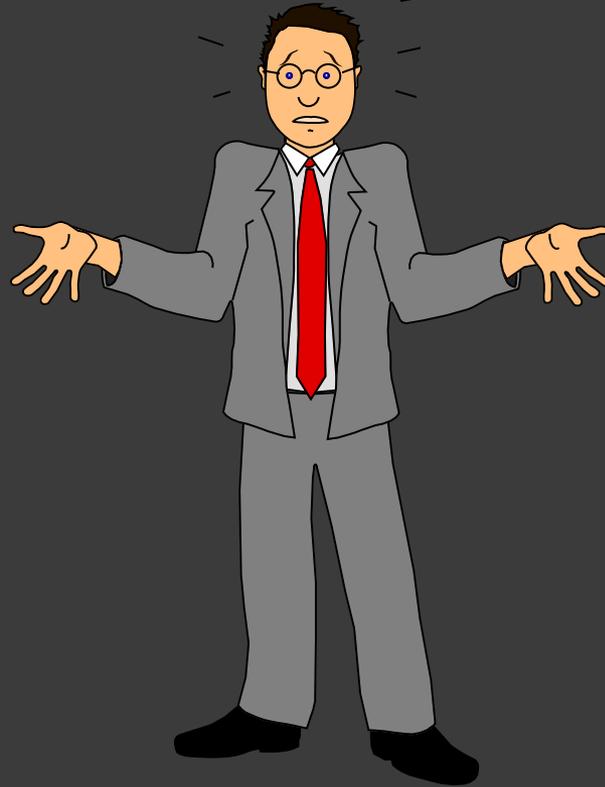
**Option 1**



**Option 2**



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Questions / Comments?

